



Original Article

Role of positive glucose challenge test only versus oral glucose tolerance test in pregnancy outcome: a comparative study

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ABSTRACT

Background: Gestational diabetes mellitus is defined as any degree of glucose intolerance which is first recognized during pregnancy and is associated with a number of adverse perinatal outcomes, such as neonatal hypoglycemia, macrosomia with an increased risk of shoulder dystocia and the need for neonatal intensive care. Maternal complications include pre-eclampsia and an increased risk of caesarean delivery. The objective of this study was to compare maternal and perinatal outcomes in pregnant women with positive and negative oral glucose tolerance test following positive glucose challenge test.

Materials and Methods: This is a prospective observational hospital based study of 120 patients admitted in Nobel Medical College Teaching Hospital, Biratnagar with glucose challenge test positive pregnancy for delivery. Oral glucose tolerance test was performed in all the glucose challenge test positive pregnant and compared with various maternal parameters and newborn's conditions.

Results: Among 120 patients included in the study, 28 (30.4%) cases were oral glucose tolerance test. Pregnancy induced hypertension was present in 12 cases. Hyperbilirubinemia was present in 42, hypoglycemia in 32, respiratory distress in 44, birth asphyxia in 15 and macrosomia in 6 cases.

Conclusion: Pregnancy induced hypertension and hyperbilirubinemia were found to be significantly higher in OGTT positive cases so early detection of GDM screening via is advisable

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INTRODUCTION

The term diabetes was coined by Aretaeus of Cappadocia.¹ Gestational diabetes mellitus (GDM) is defined as any degree of glucose intolerance which is first recognized during pregnancy.² This broad definition includes women with undiagnosed type 2 diabetes prior to pregnancy and women who coincidentally develop acute type 1 diabetes during pregnancy. The increasing prevalence of type 2 diabetes in general, and in younger people in particular, has led to an increasing number of pregnancies with this complication.² About 10% of women with GDM have circulating islet-cell antibodies, they may have a “latent” form of type1 diabetes, although their risk of developing type 1 diabetes is not known.⁴ The increased obstetrical risk

Table 1: CC Criteria for abnormal result on 100 g OGTT in pregnant women

Blood sample	CC Criteria
Fasting	>95 mg/dL (5.3 mmol/L)
1-hour	>180 mg/dL (10.0 mmol/L)
2-hour	>155 mg/dL (8.6 mmol/L)
3-hour	>140 mg/dL (7.8 mmol/L)

associated with GDM was first described by Dr. Hoet JP in 'Diabetes' in 1954. Later, Dr. John B. O'Sullivan published the O'Sullivan criteria, which became the standard for diabetes detection in pregnancy for the next 40 years.⁵

GDM affects between 2% and 9% of all pregnant women in Western countries.⁶⁻⁸ In India prevalence rate ranges from 15-21%.⁹ In Nepal, the incidence of GDM has been reported as 0.75% which is quite low.¹⁰ However, nationwide data is not available.

Hyperglycemia in pregnancy is associated with adverse perinatal outcomes, such as neonatal hypoglycemia, macrosomia, with an increased risk of shoulder dystocia, and need for neonatal intensive care. Maternal complications include an increased risk of pre-eclampsia and caesarean delivery.¹¹ Furthermore, women with GDM have up to 60% risk of developing type-2 diabetes mellitus within 5-15 years of delivery^{12,13}. It has been suggested that children prenatally exposed to a diabetic mother have an increased risk for developing Type 2 diabetes later in life.¹²⁻¹⁵

The American Diabetes Association (ADA) suggests that all the pregnant women between 24th -28th weeks of gestation should be screened for GDM, unless they are of low risk status.⁶ Universal screening has been endorsed by both the American Diabetes Position Statement and the first, second and third international workshop conferences on GDM.^{6,16,17} The fourth international workshop conference

has endorsed on selective screening. It is acknowledged that selective screening approach will miss a proportion of GDM perhaps up to 30%.⁷ The babies of mothers who have diabetes during pregnancy are reported to have 45% risk of developing diabetes, compared with 8.6 % in babies of mothers who develop diabetes after pregnancy and 1.4% in babies of mothers without diabetes.¹⁸

The objective of this research is to study and compare maternal & perinatal outcomes in pregnant women with positive and negative OGTT following positive GCT.

MATERIALS AND METHODS

This is a hospital based prospective study done at Nobel medical college hospital and research center, Biratnagar, Nepal from 1st February, 2017 to 31st January, 2018. Ethical clearance was obtained from Institutional Review Committee. During this period, pregnant women of 24-28 weeks of gestation attending outpatient department for antenatal checkup were considered for study. GCT was done as a routine test on all of these females, for which 50 gm of glucose dissolved in 200ml of water, was given to patient to be consumed over 5 minutes period (without regard to time of day or time of last meal). Blood glucose level was measured after one hour of glucose intake. A GCT \geq 140 mg/dL was considered as positive GCT. All patients with positive GCT were included in the study with an exclusion of patients with overt diabetes mellitus and patient with history of pancreatitis. Women with positive GCT were recommended for OGTT. Patient were advised to have unrestricted diet for 3 days prior to the test. The test was performed in the morning after an overnight fast of 8-14hours. Fasting blood glucose sample was taken and then 100 gram of anhydrous glucose was given. Blood glucose level was measured after 1 hour, 2 hours and 3 hours of glucose intake. GDM was diagnosed if two or more of serum glucose values were met or exceeded

Table 2: Distribution of maternal variables among study population.

Parameter	OGTT Positive	OGTT Negative	Total	
Gravida	Primi	13(10.83%)	40(33.33%)	53(44.16%)
	G2	11(9.17%)	37(30.83%)	48(40.00%)
	G3	02(1.67%)	09(7.50%)	11(9.17%)
	G3	02(1.67%)	06(5.00%)	08(6.67%)
Mode of delivery	Vaginal	10(8.34%)	52(43.33%)	62(51.67%)
	Caesarean section	14(11.67%)	30(25.00%)	44(36.67%)
	Vacuum assisted	04(3.33%)	10(8.33%)	14(11.66%)
Liquor	Adequate	18(15.00%)	68(56.67%)	86(71.67%)
	Polyhydramnios	06(5.00%)	06(5.00%)	12(10.00%)
	Oligohydramnios	04(3.33%)	18(15.00%)	22(18.33%)
Pregnancy induced hypertension (PIH)	Present	08(6.67%)	04(3.33%)	12(10.00%)
	Absent	20(16.67%)	88(73.33%)	108(90.00%)
Period of gestation	Preterm	04(3.33%)	20(16.67%)	24(20.00%)
	Term	24(20.00%)	72(60.00%)	96(80.00%)

Table 3: Distribution of neonatal variables among live birth babies

Parameter		OGTT Positive	OGTT Negative	Total
Hypoglycemia	Present	08 (6.84%)	24(20.51%)	32(27.35%)
	Absent	20(17.09%)	65(55.56%)	85(72.65%)
Birth asphyxia	Present	04(3.42%)	11(9.40%)	15(12.82%)
	Absent	24(20.51%)	78(66.67%)	102(87.18%)
Respiratory distress	Present	16(13.68%)	28(23.93%)	44(37.61%)
	Absent	12(10.25%)	61(52.14%)	73(62.39%)
Birth weight	Low birth weight	06(5.13%)	10(8.55%)	16(13.68%)
	Appropriate for age	18(15.38%)	77(65.81%)	95(81.19%)
	Macrosomia	04(3.49%)	02(1.71%)	06(5.13%)
	Hyperbilirubinemia	22(18.80%)	20(17.10%)	42(35.90%)
Period of gestation		06(5.13%)	69(58.97%)	75(64.10%)
	Absent	20(16.67%)	88(73.33%)	108(90.00%)
	Preterm	04(3.33%)	20(16.67%)	24(20.00%)

according to Carpenter & Coustan (CC) criteria (Table 1).¹⁹ All the pregnant women with positive GCT were followed up every four weekly till 28 weeks, every fortnightly till 37 weeks and weekly till delivery. During each antenatal visit weight, blood pressure, symphysio-fundal height, urine sugar, albumin and microscopy, and random blood sugar level of these patients were measured. Patients diagnosed as GDM were also followed up with fasting blood sugar and post prandial blood sugar at each visit. The maternal outcome was followed up in terms of mode of delivery, PIH, status of the liquor and perinatal outcomes was followed up in terms of birth weight, hypoglycemia, macrosomia, hyperbilirubinemia and respiratory distress syndrome.

The data were analyzed using SPSS software and mean, frequency was calculated. Chi-square test was applied to find the p-value where necessary.

RESULTS

A total of 2357 patients came to OPD for antenatal checkup with a gestational period of 24-28 weeks. GCT was performed on all of these patients. A total of 281(11.9%) patients with positive GCT were considered for the study and OGTT was done. Out of them, 120 patients who delivered babies in Nobel medical college obstetrics department were taken as the study population. The patient's age ranged from 16 to 39 years. Maternal variables are tabulated in table 2. Most of the patients were Primi of g2 (n=101,; 84.1%). Pregnancy induced hypertension was observed in 12 (10%) patients (Table 2). Among the total 120 patients with high GCT value, 28 (23.34%) were OGTT positive. Incidence of GDM was 1.18% in the study population.

Among these variables, PIH showed statistically significant difference between the two groups. and p-value for PIH was <0.000183. Rests of the variables were statistically insignificant.

Among the 120 deliveries, 3 babies died in utero. One had tracheoesophageal fistula. However, the cause of death of other two babies couldn't be identified. Among remaining 117 newborns, hypoglycemia was observed in 32 cases (27.3%).

Among these variables, only hyperbilirubinemia show statistically significant difference (p-value < 0.00001) between the two groups. Chi-Square test was used to find statistical significance. Rests of the variables were not statistically significant.

DISCUSSION

GDM is defined as carbohydrate intolerance that is first recognized or begins during pregnancy It is associated with increased maternal, fetal, and neonatal risks. The prevalence of GDM is increasing and it complicates approximately 7% of all pregnancies in the United States, probably because of increasing rates of overweight and obesity. A universal recommendation for the ideal approach for screening and diagnosis of GDM is difficult to find. At this time, the Committee on Obstetric Practice continues to recommend a two-step approach to screening and diagnosis.²⁰

Majority of the cases, among the study population, were delivered vaginally. Out of which 62 cases had spontaneous delivery. Among the OGTT positive cases the numbers of lower segment Caesarean section (LSCS) (n=14, 50%) outnumbered spontaneous delivery. A major indication for LSCS was failed induction. However, this data was not significant since large number of OGTT negative cases (n=32, 32.6%) were also delivered by LSCS. Failed induction was the major indication in these cases as well. Deerochanawong et al in their study of 709 women found that 32% and 70% of those diagnosed as GDM by World Health Organization (WHO) criteria and National Diabetes Data group (NDDG) criteria respectively underwent LSCS.²¹

Emmanuel Odar et al in their study of 90 women, observed that mothers with GDM (WHO criteria) were twice as likely to have caesarean section because of big babies and obstructed labor than the controls without GDM.²²

In a study by Sahu et al, polyhydramnios was most common antenatal complication and it was observed that 36% of GDM cases diagnosed by ADA and 22% GDM cases diagnosed by WHO criteria had polyhydramnios.²³ In this study, amount of fluid with respect to status of OGTT was not significant.

PIH was the major complication in the patient group with positive OGTT which was statistically significant when compared with negative group. Among the OGTT positive patients 28.57 % showed features of PIH. In a study done by Shrestha et al¹⁶ it was 25% which was comparable with other studies.^{12,24-26} An article published by Wendland et al concluded that there was a positive and statistically significant association between PIH and the WHO diagnostic criteria.²⁷

In concordance with other studies, macrosomia was found more in OGTT positive mother.¹⁰ In study by Schmidt et al, GDM by both WHO and ADA criteria predicted an increased risk of macrosomia, and perinatal death.²⁸ Emmanuel Odar et al observed that the babies of mothers with GDM (WHO criteria) were more likely to be macrosomic (36.7%), perinatal mortality (16.7%) and have shoulder dystocia (23.3%) than those of normal mothers.²⁹ A study done at Parkland Hospital, Dallas, risk of malformed infants was 1.5% in non-diabetic women and this risk was increased 3.2 fold (4.8%) in women with GDM.³⁰ In this study, two babies had congenital anomalies. One out of them died and the one who survived had an atrial septal defect.

Three babies born had died in utero. All of them were born to OGTT negative mothers. Among the alive babies perinatal complications seen were hypoglycemia, hyperbilirubinemia, birth asphyxia and respiratory distress. 78.5% of babies born from OGTT positive mother developed jaundice. The data was significant statistically and was higher than the other studies.^{24,30,31}

CONCLUSIONS

GCT is a simple, convenient and cheap test and appeared to be a feasible and acceptable screening test. PIH and hyperbilirubinemia showed statistically significant difference between the OGTT positive and negative groups. Hence, OGTT cannot be replaced by GCT for the diagnosis of GDM.

Limitations of study

- Patients were screened at the OPD and lots of patients

were lost in the follow up.

- Some of the patients were delivered outside the Nobel medical college and couldn't be included in the study.

Conflict of Interest: None

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